TABLE E3

Experimental Setup of the Immunization Studies

Immunization group	Route of immunization	No. of animals	Antigen formulation
	Systemic		Total application volume: 500 μl of
Buffer control	(i.p.)	6	D-PBS
Peptide	(i.p.)	6	50 μg Peptide in buffer
Peptide + MDP	(i.p.)	6	50 μg Peptide + 50 μg MDP in buffer
Peptomer	(i.p.)	6	50 μg Peptomer in buffer
Peptomer + MDP	(i.p.)	6	50 μg Peptomer + 50 μg MDP in buffer
Peptomer – Particles	(i.p.)	6	50 μg Peptomer on Al_2O_3-particles in buffer
Peptomer – Particles + MDP	(i.p.)	4	50 μg Peptomer on Al_2O_3-particles + 50 μg MDP in buffer
	Mucosal		Total application volume: 300 μl of
Buffer control	(i.g.)	6	100 mM Sodium bicarbonate
Peptide + CT	(i.g.)	6	200 μg Peptide + 5 μg CT in buffer
Peptomer + CT	(i.g.)	6	200 μg Peptomer + 5 μg CT in buffer
Peptomer – Particles + CT	(i.g.)	5	200 μg Peptomer on Al_2O_3-particles + 5 μg CT in buffer

TABLE E4

Schedule of the Immunizations and Sampling Experiments

Route of Immunization	No. and time of immunizations	Time of sample collections: Blood	Feces	Intestinal secretions	Spleen cells
Systemic	4 doses on days 0, 14, 28, 42	on days −2, 13, 27, 41, 52	—	—	on day 53
Mucosal	4 doses on days 0, 21, 42, 63	on days −1, 20, 41, 62, 71	on days −2, 19, 40, 61, 70	on day 71	on day 71

TABLE E5

Anti ^{HIV}MN gp120 C4 Domain Peptomer Serum IgG Responses in Different Mouse Strain[a]

Day	log IgG titer[b]: CD1 (outbred)	Balb/c (H-2^d)
−1	<2	<2
13	<2	<2
27	3.37 ± 0.22	3.6 ± 0.11
42	3.95 ± 0.25	4.83* ± 0.11
52	4.48 ± 0.34	5.76* ± 0.14

[a]Mice were immunized systemically with peptomer – particles + MDP and bled as outlined in Tables E3 and E4.
[b]Titers were determined by ELISA against C4 domain peptomer and are expressed as geometric means ± SEM of endpoint titers of 6 animals.
*Asterisks indicate significant differences in the anti-C4 domain peptomer serum IgG responses of CD1 and Balb/c mice (unpaired, two-tailed t-test, $p < 0.01$)

What is claimed is:

1. A spatially aligned conjugated composition suitable as an immunogen to be administered to a living subject for inducing an immune response against a prechosen infectious agent, said conjugated composition comprising:

at least one chemically modified substance wherein said chemical modification provides said substance with at least one reactive entity and a fixed spatial orientation for forming a thioether bond and wherein said substance is selected from the group consisting of haptens and antigens immunologically representative of the prechosen infectious agent;

a plurality of chemically substituted metallic oxide particles wherein said chemical substitution provides said particles with at least one corresponding reactive moiety for forming a thioether bond and wherein said metallic oxide particles have a diameter size ranging from about 10–10,000 nanometers; and

at least one thioether bond joining said modified substance in a controlled orientation to said nanometer-sized substituted metallic oxide particles to form a plurality of spatially aligned conjugates.

2. The spatially aligned conjugated composition as recited in claim **1** wherein said chemically modified substance comprises a polysaccharide composition.

3. The spatially aligned conjugated composition as recited in claim **1** wherein said chemically modified substance comprises a proteinaceous composition.

4. The spatially aligned conjugated composition as recited in claim **1** wherein said metallic oxide particles are composed of aluminum oxide.

5. The spatially aligned conjugated composition as recited in claim **1** wherein said metallic oxide particles are composed of at least one selected from the group consisting of aluminum oxide (Al_2O_3), titanium dioxide (TiO_2), zirconium dioxide (ZrO_2), hydroxyapatite ($Ca_5(OH)(PO_4)_3$), silicon dioxide (SiO_2), magnesium oxide (MgO), yttrium oxide (Y_2O_3), scandium oxide (Sc_2O_3), and lanthanum oxide (La_2O_3).